

CLAIMS

We claim:

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A method for performing an ion implantation comprising:

providing a target chamber for containing a target for
implantation and an ion source chamber including an ion
source for generating an ion beam;

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providing a beam deceleration optics that includes a beam
deceleration means in said ion source chamber for
decelerating said ion beam for producing a low energy ion
beam;

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providing a beam steering means to said beam deceleration
optics to separate neutralized particles out of said ion beam
by keeping said neutralized particles propagating in a
neutralized-particle direction slightly different from a
steered targeted ion-beam direction; and

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employing said ion-beam deceleration optics for
transmitting said ion beam along said targeted ion-beam
direction to said target for implantation and for blocking
said neutralized particles from reaching said target for
implantation.

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2. The method of performing an ion implantation of claim 1
wherein:

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providing an analyzer magnet to said ion source chamber
for mass filtering.

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3. The method of performing an ion implantation of claim 1 wherein:

said step of employing said beam deceleration means further includes a step of providing a deceleration electric-field means for generating a deceleration electric-field for decelerating said ion beam for producing a low energy ion beam.

4. The method of performing an ion implantation of claim 1 wherein:

said step of employing said ion beam steering means for generating an electrostatic field for keeping said neutralized particle to transmit along a trajectory different than said ion beam carrying electric charges comprising a step of steering said ion beam to transmit in a targeted ion-beam direction slightly different from said neutralized-particle direction.

5. The method of performing an ion implantation of claim 1 wherein:

said step of employing an ion-beam deceleration optics further includes a step of employing a neutralized beam blocking means for blocking said neutralized particle from reaching said target of implantation in said target chamber.

said step of providing an ion source in an ion source chamber is a step of providing an ion source for generating a positive charged ion beam; and

said step of employing said beam deceleration means includes the step of employing a deceleration electric-field means for generating a negative electric-field for decelerating said ion beam for producing a low energy ion beam.

said step of employing said ion beam steering means comprising a step of steering said ion beam carrying electric charges to transmit in said targeted ion-beam direction at a small deflected angle.

said step of employing said ion beam steering means to steer said ion beam carrying electric charges to transmit in said targeted ion-beam direction comprising a step of steering said ion beam at a small deflected angle in a range of three to fifteen degrees relative to the horizontal axis.

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9. The method of performing an ion implantation of claim 1 wherein:

5 said step of providing said ion source in said ion source chamber comprising a step of providing said ion source chamber and said target chamber with a vacuum in the range of 10^{-5} Torr; and

10 said step of employing said ion beam deceleration means comprising a step of decelerating said ion beam to an energy level as low as about 200 eV with an energy contamination of less than about 0.1%.

10. A method for generating an implantation ion beam from an ion source projecting a plurality of ions comprising:

15 employing a beam deceleration means for decelerating said ions projected from said ion source;

20 employing a beam steering means for generating an electrostatic field for separating a plurality of neutralized particles from said ion ions by keeping said neutralized particles propagating in a neutralized-particle direction slightly different from a targeted ion-beam direction of said ions.

11. A method of claim 10 further comprising:

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30 arranging a wafer implant position corresponding to said targeted ion-beam direction for accepting said ions projected thereto.

12. The method of claim 10 further comprising:
- 5 said step of transmitting said ions to a target of implantation further comprising a step of employing a means for blocking said neutralized particles from reaching said target of implantation.
13. The method of claim 10 wherein:
- 10 said step of separating said neutralized particles from said ions comprising a step of providing a charged particle deflection means for deflecting said trajectory of said ions at a small angle from said trajectory of said neutralized particles.
- 15 14. The method of claim 10 further comprising:
- configuring said ion beam deceleration means for decelerating and processing said ions into an ion beam having a large beam-height to beam-width ratio.
- 20 15. The method of claim 10 further comprising:
- providing a beam block for blocking said neutralized particles propagating in said neutralized-particle direction.
- 25 16. The method of claim 10 further comprising:
- projecting said ions in forming said implantation ion beam with high beam current and low and a ratio of a beam height to a beam width equal or larger than 20.
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17. The method of claim 16 wherein:

5 said step of forming said implantation ion beam having a ratio of a beam height to a height to a beam width equal or larger than 20 comprising a step of providing an extraction aperture for said ion source with an aspect ratio equal or larger than 20.

- 10 18. The method of claim 10 wherein:

15 said step of configuring said ion beam deceleration means for decelerating and processing said ions into an ion beam having a large beam-height to beam-width ratio comprising a step of processing said ions into an ion beam having a beam-height to beam-width ratio equal or greater than 4.

19. The method of claim 18 wherein:

20 said step of processing said ions into an ion beam having a beam-height to beam-width ratio equal or greater than 4 comprising a step of providing an aperture of a deceleration and steering optics having a beam-height to beam-width ratio equal or greater than 4.

- 25 20. The method of claim 13 wherein:

30 said step of providing a charged particle deflection means for deflecting said trajectory of said ions at a small angle from said trajectory of said neutralized particles comprising a step of deflecting said trajectory of said ions at an angle in the range of three to fifteen degrees.

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